

SIX FLAGS NEW ENGLAND	
SUBJECT: COMPRESSED GAS CYLINDERS	SAFETY REFERENCE MANUAL
SECTION: 5	
EFFECTIVE: January 2016	SUPERSEDES: ALL PREVIOUS
CFR #: 29 CFR 1910.101 – <i>Subpart M</i> and 1910.253 – <i>Subpart Q</i>	

5.1 PURPOSE

To implement procedures in the safe handling and storage of compressed cylinders.

5.2 OBJECTIVE

To reduce the potential of accidents by amplifying safe work procedures in the handling of cylinders and draw closer attention to how and where they are stored in the workplace.

5.3 SCOPE

All employees who use compressed gas cylinders for their specific jobs, i.e. welding, food stands, etc.

5.4 OVERVIEW

Cylinders that contain compressed gases have to meet various construction and installation standards and they come equipped with a variety of safety features. However, compressed gas cylinders can cause a serious accident if not handled properly. Even though the cylinders are heavy, they are also very delicate and hazardous and require very careful handling and storage. Each gas has its own specific hazard(s) and a material safety data sheet must be utilized by each user in order to follow the proper precautions required to use a particular gas safely.

5.5 GENERAL HAZARDS

The hazards of compressed gases vary, but most fall into these general categories:

- Flammable
- Explosive
- Accidental release of toxic gases

Most compressed gases will burn or explode under the right circumstances.

5.6 IDENTIFYING HAZARDS

The best way to identify hazards is to look at some of the common compressed gases and their specific hazards:

Acetylene - very flammable and explosive, and its safe maximum pressure is just

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15 lbs. per square inch for small diameter piping systems.

Ammonia - is flammable, but also possesses hazards from freezer burns, severe eye injuries, and inhalation. Inhaling high concentrations of ammonia can be fatal; therefore, respirators, eye protection and impervious gloves should be worn by those who handle this type of gas.

Carbon Dioxide (CO₂) - exposure to high concentrations can be toxic. It can also cause asphyxiation of the lungs. Although CO₂ is a very effective agent used to extinguish flammable and electrical fires, it will burn rapidly when it reacts with substances such as magnesium, sodium, potassium, and metal hydrides.

Chlorine - can explode in reactions with alcohols, ethers, and petroleum products. If it is mixed with acetylene, chlorine gas will explode when exposed to intensive heat such as direct sunlight. If it is mixed with water, it becomes very corrosive and will eat through iron and steel.

Fluorine - is both corrosive and poisonous and reacts with most organic materials. Fluorine will explode when mixed with acetylene and placed in direct sunlight.

Hydrogen - extremely flammable and explosive. Requires good ventilation, particularly when being stored.

Oxygen - does not burn by itself, but flammable materials burn rapidly when exposed to oxygen. Can produce spontaneous ignition when combined with other elements and compounds.

5.7 TRAINING REQUIREMENTS

Workers in charge of compressed gas cylinders, which include oxygen or fuel gas equipment, generators, welding machines, or fuel-gas distribution piping systems shall be trained and judged competent by their employers for this type of work before being placed in charge. Rules and instructions covering the operation and maintenance of oxygen or fuel-gas supply equipment and generators shall be readily available for all who use compressed gas cylinders for each particular job. Users must also be trained on the use of fire protection equipment, such as fire extinguishers, and on the use of the personal protective equipment associated with use for each particular type of gas.

5.8 PROTECTION AGAINST HAZARDS

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Identification: Each compressed gas cylinder should be marked with its identity so the user will know which MSDS to check to find out about potential hazards and personal protective equipment required. Empty cylinders must be identified with the letters “MT”.

Storage: While there are some variations by individual gas, all cylinders must be stored in a dry well-ventilated area at least 20 feet from combustible materials, and away from other heat sources such as electrical wiring.

Cylinders shall not be stored near stairways and elevators. They should be stored on a level, fireproof floor in a location where they will not get banged and/or knocked over. Cylinders must be secured upright by a chain or cable. When cylinders are in storage, valves have to be closed and valve protection caps should be screwed down to the last thread.

Storage areas should be organized in a manner where the user can acquire the cylinder(s) that have been stored the longest. The newest cylinders received shall be placed behind the older cylinders.

When transporting compressed gas cylinders to the workplace, the user should utilize a hand truck (dolly) and secure them in an upright manner. If cylinders are transported in the back of a truck, they must be secured upright to the inside walls of the truck bed.

Cylinders shall never be rolled into place.

NOTE: Oxygen cylinders must also be stored at least 20 feet from combustible materials and/or other types of full gas cylinders.

Safety Relief Valves - Compressed gas cylinders shall have safety relief valves that are installed, maintained, and inspected before each use. These relief devices shall be arranged to discharge upward and unobstructed to the open air in such a manner to prevent any blockage of escaping gas upon the container, adjacent structure or personnel. This does not apply to the Department of Transportation’s (DOT) Specification’s for hydrogen containers having an internal volume of 2 cubic feet or less.

Safety relief devices or vent piping shall be designed and located so that moisture cannot collect and freeze in a manner which would interfere with proper operation of the device.

Use: Many of the specifics will vary from one gas to the next. There are several key points that apply to all compressed gas cylinders:

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Oxy-acetylene welding units must have flash arrestors installed on unit.

Keep the cylinders away from operations that create sparks, heat, and fire, as well as electrical circuits. This same principal applies when using gases such as acetylene and oxygen for welding operations.

Smoking is prohibited within 20 feet of all cylinders.

Read the MSDS for each type of gas cylinder before use.

Never use oil or grease on the cylinders, regulators, couplings or hoses or handle them with oily hands or gloves.

Oxygen gas discharge must not be discharged onto oily or greasy surfaces or clothing.

Never use compressed gas cylinders in unventilated areas.

Keep cylinders upright and secured at all times.

Cylinders shall not be dropped, struck or allowed to strike each other.

Open valves by hand, not with a wrench or other tool, unless a specially designed cylinder wrench is provided. If a valve does not open, notify the supplier.

An acetylene cylinder valve shall not be opened with more than 1½ turns of the spindle, and preferably no more than ¾ of a turn.

Never adjust or tamper with valve safety relief devices.

Open and close valves quickly to release stored pressure. Open slowly standing to the side rather than in front of the outlet.

Never mix gases in a cylinder or try to refill an empty cylinder.

Complete removal of the stem from a diaphragm-type cylinder valve shall be avoided.

Hoses showing leaks, burns, worn places, or other defects rendering it unfit for

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service shall be repaired or replaced.

There should be no pressure reading on the regulator gauge after the cylinder valve has been closed. If any pressure is still showing, simply bleed the excess pressure from the hose line until the gauge reads "0 psi".

Check for Leaks: The best way to check for leaks on valve outlets, hoses, valves and cylinder connections, is to close the valve completely and spray a substance, such as soapy water, directly onto the outlet's mouth or around the seal of the valve/cylinder connection. If the inspector sees "bubbles" forming on the test area, a leak is occurring and the cylinder shall not be used. Either try to hand-tightened the valve/cylinder connection or contact the supplier to have the cylinder repaired or replaced. Do not use a wrench or any other tool to tighten the valve. Take the cylinder outside and discharge the remaining gas slowly. Then stand the cylinder upright and mark as "MT". Tag the bad cylinder as such and state that it must be kept away from heat.

Never try to fix a cylinder leak or valve or any other problem. Instead, notify the supplier about the problem.

5.9 SPECIAL CONDITIONS CONCERNING ACETYLENE CYLINDERS

Acetylene cylinders are indirectly protected against overpressure by heat actuated devices, i.e. fusible plug alloys which have low melting points similar to ones found in automatic sprinkler heads and smoke detectors. They do not possess safety relief valves as found on other compressed gas cylinders, such as oxygen and hydrogen. An upright, properly stored and secured acetylene cylinder is usually a safe item used in the workplace.

Acetylene cylinders become very hazardous when the cylinder is either placed or knocked over on its side. Unlike spring-loaded pressure relief valves, the operation of fusible plugs in an acetylene cylinder results in the complete reduction of atmospheric pressure inside the cylinder. This is because both the compressed gas (acetylene) and the actual chemical composition (acetone) are released at the same time. The compressed gas and the acetone unite in preparation to be released from the cylinder. But when there is no opening of the valve and no spring-loaded safety relief device, pressure builds inside the cylinder. Therefore, once the atmospheric pressure inside the cylinder exceeds 15 psi, internal combustion will occur which results in a Boiling Liquid Expanding Vapor Explosion (BLEVE) effect, such as cylinder rupture and propulsion accompanied by small fireballs. This explosive, "missile-like" accident can result in property damage and severe injuries.

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Therefore, ensure that acetylene cylinder are stored properly in an upright manner, and secured with a chain. When not in use, the contents inside the cylinder should not exceed 15 psi.